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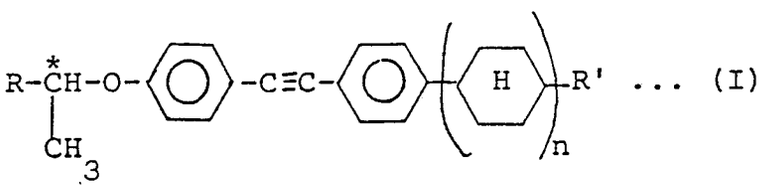
(54) Novel optically active tolan derivatives and process for preparing same.

(57) Novel optically active tolan derivative represented by the general formula (I) and process for preparing thereof;



(wherein all the symbols are the same as defined in the appended claims) are disclosed. These are effective for use in preparation of liquid crystal material capable of effectively preventing the formation of the cross-talk phenomenon due to changes due to temperature in the high level multiplexing driving system.

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NOVEL OPTICALLY ACTIVE TOLAN DERIVATIVES AND PROCESS FOR PREPARING SAME

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to novel optically active tolan derivatives which are usefull as electro-optical display materials and a process for preparing same.

Description of Prior Art

In recent years, liquid crystal display cells of high multiplexing driving systems have been gradually increased in size, leading to an increasing demand as displays for computer terminals, TV sets and so forth. With this increase in demand, liquid crystal materials having high level multiplexibility have been more needed.

High level multiplexing driving systems are depending on change in the environmental temperature and the cross-talk phenomenon will easily occur. In order to prevent the formation of the cross-talk phenomenon due to changes in the environmental temperature, the following have been known; (1) a method in which a temperature compensation circuit is provide in the liquid crystal display equipment, and (2) a method in which the temperature dependency of threshold voltage of liquid crystal material is decreased by adding a chiral substance the molecular orientation of which is twisted right and a chiral substance the molecular orientation of which is twisted left, with respect to the liquid crystal material. The method (1), however, has a disadvantage in that the equipment becomes expensive. Also the method (2) has a disadvantage in that the amount of the substances added is limited because if the amount of the substances added is increased, the response time is decreased, although the substances are necessary to add in large amounts in order to sufficiently obtain the desired effect; therefore the desired effect cannot be obtained sufficiently.

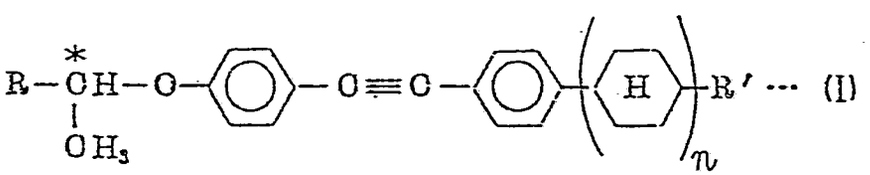
SUMMARY OF THE INVENTION

An object of this invention is to efficiently prevent the cross-talk phenomenon due to changes in the environmental temperature in high level multiplexing driving systems.

Another object of this invention is to provide novel tolan derivatives which when added to various practical nematic liquid crystal compositions, are able to sufficiently decrease the temperature dependency of threshold voltage of the compositions even in small amounts.

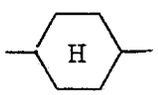
It has been found that the objects can be attained by using compounds represented by the general formula (I) as described hereinafter.

This invention provides novel optically active tolan derivatives represented by the general formula (I):



(I)

(wherein R represents a straight alkyl group having 2 to 8 carbon atoms, R′ represents a straight alkyl group having 1 to 20 carbon atoms or a straight alkoxy group having 1 to 20 carbon atoms, n represents 0 or 1,



represents a trans(equatorial-equatorial) cyclohexyl ring, and $\overset{*}{C}$ represents an asymmetrical carbon atom).

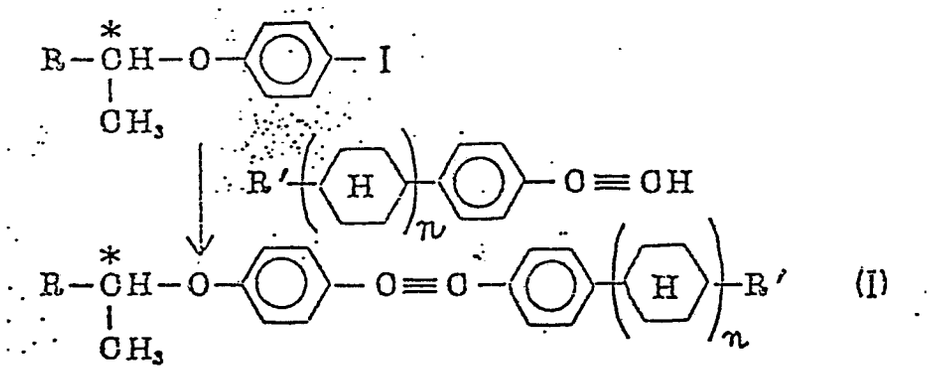
BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a graph showing the temperature dependency of threshold voltage of a chiral nematic liquid crystal composition which is prepared by adding 0.14 wt% of Optically Active Compound No. 33 (dextro rotation:) of the present invention to a mixed liquid crystal (A) commonly used as a nematic liquid crystal material at the present time.

Fig. 2 is a graph showing the temperature dependency of threshold voltage of a chiral nematic liquid crystal composition which is prepared by adding 0.70 wt% of Optically Active Compound No. 299 (dextro rotation) of this invention to a mixed liquid crystal (B) commonly used as a nematic liquid crystal material at the present time.

DETAILED DESCRIPTION OF THE INVENTION

The compounds of the general formula (I) can be prepared according to the following sequence.



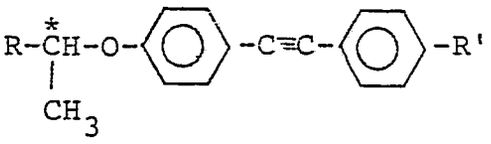
(I)

(wherein R, R', n and $\overset{*}{C}$ are as defined above).

4-iodophenyl-1'-methylalkyl ether is reacted with 4-alkylphenylacetylene, 4-alkoxyphenylacetylene, 4-(trans-4'-alkylcyclohexyl)phenylacetylene or 4-(trans-4'-alkoxycyclohexyl)phenylacetylene in a solvent such as diethylamine by the use of a catalyst such as bis(triphenylphosphine)palladium (II) chloride to form the compound of the general formula (I).

Representative examples of the compounds represented by the general formula (I) are shown in Tables 1 and 2.

TABLE 1



No.	R	R'
1	C_2H_5-	CH_3-
2	n-C_3H_7-	CH_3-
3	n-C_4H_9-	CH_3-
4	n-C_5H_{11}-	CH_3-
5	n-C_6H_{13}-	CH_3-
6	n-C_7H_{15}-	CH_3-
7	n-C_8H_{17}-	CH_3-
8	C_2H_5-	C_2H_5-
9	n-C_3H_7-	C_2H_5-
10	n-C_4H_9-	C_2H_5-
11	n-C_5H_{11}-	C_2H_5-
12	n-C_6H_{13}-	C_2H_5-
13	n-C_7H_{15}-	C_2H_5-
14	n-C_8H_{17}-	C_2H_5-
15	C_2H_5-	n-C_3H_7-
16	n-C_3H_7-	n-C_3H_7-
17	n-C_4H_9-	n-C_3H_7-
18	n-C_5H_{11}-	n-C_3H_7-

No.	R	R'
19	$n\text{-}C_6H_{13}-$	$n\text{-}C_3H_7-$
20	$n\text{-}C_7H_{15}-$	$n\text{-}C_3H_7-$
21	$n\text{-}C_8H_{17}-$	$n\text{-}C_3H_7-$
22	C_2H_5-	$n\text{-}C_4H_9-$
23	$n\text{-}C_3H_7-$	$n\text{-}C_4H_9-$
24	$n\text{-}C_4H_9-$	$n\text{-}C_4H_9-$
25	$n\text{-}C_5H_{11}-$	$n\text{-}C_4H_9-$
26	$n\text{-}C_6H_{13}-$	$n\text{-}C_4H_9-$
27	$n\text{-}C_7H_{15}-$	$n\text{-}C_4H_9-$
28	$n\text{-}C_8H_{17}-$	$n\text{-}C_4H_9-$
29	C_2H_5-	$n\text{-}C_5H_{11}-$
30	$n\text{-}C_3H_7-$	$n\text{-}C_5H_{11}-$
31	$n\text{-}C_4H_9-$	$n\text{-}C_5H_{11}-$
32	$n\text{-}C_5H_{11}-$	$n\text{-}C_5H_{11}-$
33	$n\text{-}C_6H_{13}-$	$n\text{-}C_5H_{11}-$
34	$n\text{-}C_7H_{15}-$	$n\text{-}C_5H_{11}-$
35	$n\text{-}C_8H_{17}-$	$n\text{-}C_5H_{11}-$
36	C_2H_5-	$n\text{-}C_6H_{13}-$
37	$n\text{-}C_3H_7-$	$n\text{-}C_6H_{13}-$
38	$n\text{-}C_4H_9-$	$n\text{-}C_6H_{13}-$
39	$n\text{-}C_5H_{11}-$	$n\text{-}C_6H_{13}-$
40	$n\text{-}C_6H_{13}-$	$n\text{-}C_6H_{13}-$
41	$n\text{-}C_7H_{15}-$	$n\text{-}C_6H_{13}-$
42	$n\text{-}C_8H_{17}-$	$n\text{-}C_6H_{13}-$

No.	R	R'
43	C_2H_5-	n-C_7H_{15}-
44	n-C_3H_7-	n-C_7H_{15}-
45	n-C_4H_9-	n-C_7H_{15}-
46	n-C_5H_{11}-	n-C_7H_{15}-
47	n-C_6H_{13}-	n-C_7H_{15}-
48	n-C_7H_{15}-	n-C_7H_{15}-
49	n-C_8H_{17}-	n-C_7H_{15}-
50	C_2H_5-	n-C_8H_{17}-
51	n-C_3H_7-	n-C_8H_{17}-
52	n-C_4H_9-	n-C_8H_{17}-
53	n-C_5H_{11}-	n-C_8H_{17}-
54	n-C_6H_{13}-	n-C_8H_{17}-
55	n-C_7H_{15}-	n-C_8H_{17}-
56	n-C_8H_{17}-	n-C_8H_{17}-
57	C_2H_5-	n-C_9H_{19}-
58	n-C_3H_7-	n-C_9H_{19}-
59	n-C_4H_9-	n-C_9H_{19}-
60	n-C_5H_{11}-	n-C_9H_{19}-
61	n-C_6H_{13}-	n-C_9H_{19}-
62	n-C_7H_{15}-	n-C_9H_{19}-
63	n-C_8H_{17}-	n-C_9H_{19}-
64	C_2H_5-	n-$C_{10}H_{21}$-
65	n-C_3H_7-	n-$C_{10}H_{21}$-
66	n-C_4H_9-	n-$C_{10}H_{21}$-

No.	R	R'
67	$n\text{-}C_5H_{11}$-	$n\text{-}C_{10}H_{21}$-
68	$n\text{-}C_6H_{13}$-	$n\text{-}C_{10}H_{21}$-
69	$n\text{-}C_7H_{15}$-	$n\text{-}C_{10}H_{21}$-
70	$n\text{-}C_8H_{17}$-	$n\text{-}C_{10}H_{21}$-
71	C_2H_5-	$n\text{-}C_{11}H_{23}$-
72	$n\text{-}C_3H_7$-	$n\text{-}C_{11}H_{23}$-
73	$n\text{-}C_4H_9$-	$n\text{-}C_{11}H_{23}$-
74	$n\text{-}C_5H_{11}$-	$n\text{-}C_{11}H_{23}$-
75	$n\text{-}C_6H_{13}$-	$n\text{-}C_{11}H_{23}$-
76	$n\text{-}C_7H_{15}$-	$n\text{-}C_{11}H_{23}$-
77	$n\text{-}C_8H_{17}$-	$n\text{-}C_{11}H_{23}$-
78	C_2H_5-	$n\text{-}C_{12}H_{25}$-
79	$n\text{-}C_3H_7$-	$n\text{-}C_{12}H_{25}$-
80	$n\text{-}C_4H_9$-	$n\text{-}C_{12}H_{25}$-
81	$n\text{-}C_5H_{11}$-	$n\text{-}C_{12}H_{25}$-
82	$n\text{-}C_6H_{13}$-	$n\text{-}C_{12}H_{25}$-
83	$n\text{-}C_7H_{15}$-	$n\text{-}C_{12}H_{25}$-
84	$n\text{-}C_8H_{17}$-	$n\text{-}C_{12}H_{25}$-
85	C_2H_5-	$n\text{-}C_{13}H_{27}$-
86	$n\text{-}C_3H_7$-	$n\text{-}C_{13}H_{27}$-
87	$n\text{-}C_4H_9$-	$n\text{-}C_{13}H_{27}$-
88	$n\text{-}C_5H_{11}$-	$n\text{-}C_{13}H_{27}$-
89	$n\text{-}C_6H_{13}$-	$n\text{-}C_{13}H_{27}$-
90	$n\text{-}C_7H_{15}$-	$n\text{-}C_{13}H_{27}$-

No.	R	R'
91	$n\text{-}C_8H_{17}$-	$n\text{-}C_{13}H_{17}$-
92	C_2H_5-	$n\text{-}C_{14}H_{29}$-
93	$n\text{-}C_3H_7$-	$n\text{-}C_{14}H_{29}$-
94	$n\text{-}C_4H_9$-	$n\text{-}C_{14}H_{29}$-
95	$n\text{-}C_5H_{11}$-	$n\text{-}C_{14}H_{29}$-
96	$n\text{-}C_6H_{13}$-	$n\text{-}C_{14}H_{29}$-
97	$n\text{-}C_7H_{15}$-	$n\text{-}C_{14}H_{29}$-
98	$n\text{-}C_8H_{17}$-	$n\text{-}C_{14}H_{29}$-
99	C_2H_5-	$n\text{-}C_{15}H_{31}$-
100	$n\text{-}C_3H_7$-	$n\text{-}C_{15}H_{31}$-
101	$n\text{-}C_4H_9$-	$n\text{-}C_{15}H_{31}$-
102	$n\text{-}C_5H_{11}$-	$n\text{-}C_{15}H_{31}$-
103	$n\text{-}C_6H_{13}$-	$n\text{-}C_{15}H_{31}$-
104	$n\text{-}C_7H_{15}$-	$n\text{-}C_{15}H_{31}$-
105	$n\text{-}C_8H_{17}$-	$n\text{-}C_{15}H_{31}$-
106	C_2H_5-	$n\text{-}C_{16}H_{33}$-
107	$n\text{-}C_3H_7$-	$n\text{-}C_{16}H_{33}$-
108	$n\text{-}C_4H_9$-	$n\text{-}C_{16}H_{33}$-
109	$n\text{-}C_5H_{11}$-	$n\text{-}C_{16}H_{33}$-
110	$n\text{-}C_6H_{13}$-	$n\text{-}C_{16}H_{33}$-
111	$n\text{-}C_7H_{15}$-	$n\text{-}C_{16}H_{33}$-
112	$n\text{-}C_8H_{17}$-	$n\text{-}C_{16}H_{33}$-
113	C_2H_5-	$n\text{-}C_{17}H_{35}$-
114	$n\text{-}C_3H_7$-	$n\text{-}C_{17}H_{35}$-

No.	R	R'
115	$n\text{-}C_4H_9$-	$n\text{-}C_{17}H_{35}$-
116	$n\text{-}C_5H_{11}$-	$n\text{-}C_{17}H_{35}$-
117	$n\text{-}C_6H_{13}$-	$n\text{-}C_{17}H_{35}$-
118	$n\text{-}C_7H_{15}$-	$n\text{-}C_{17}H_{35}$-
119	$n\text{-}C_8H_{17}$	$n\text{-}C_{17}H_{35}$-
120	C_2H_5-	$n\text{-}C_{18}H_{37}$-
121	$n\text{-}C_3H_7$-	$n\text{-}C_{18}H_{37}$-
122	$n\text{-}C_4H_9$-	$n\text{-}C_{18}H_{37}$-
123	$n\text{-}C_5H_{11}$-	$n\text{-}C_{18}H_{37}$-
124	$n\text{-}C_6H_{13}$-	$n\text{-}C_{18}H_{37}$-
125	$n\text{-}C_7H_{15}$-	$n\text{-}C_{18}H_{37}$-
126	$n\text{-}C_8H_{17}$-	$n\text{-}C_{18}H_{37}$-
127	C_2H_5-	$n\text{-}C_{19}H_{39}$-
128	$n\text{-}C_3H_7$-	$n\text{-}C_{19}H_{39}$-
129	$n\text{-}C_4H_9$-	$n\text{-}C_{19}H_{39}$-
130	$n\text{-}C_5H_{11}$-	$n\text{-}C_{19}H_{39}$-
131	$n\text{-}C_6H_{13}$-	$n\text{-}C_{19}H_{39}$-
132	$n\text{-}C_7H_{15}$-	$n\text{-}C_{19}H_{39}$-
133	$n\text{-}C_8H_{17}$-	$n\text{-}C_{19}H_{39}$-
134	C_2H_5-	$n\text{-}C_{20}H_{41}$-
135	$n\text{-}C_3H_7$-	$n\text{-}C_{20}H_{41}$-
136	$n\text{-}C_4H_9$-	$n\text{-}C_{20}H_{41}$-
137	$n\text{-}C_5H_{11}$-	$n\text{-}C_{20}H_{41}$-
138	$n\text{-}C_6H_{13}$-	$n\text{-}C_{20}H_{41}$-

No.	R	R'
139	$n\text{-}C_7H_{15}$-	$n\text{-}C_{20}H_{41}$-
140	$n\text{-}C_8H_{17}$-	$n\text{-}C_{20}H_{41}$-
141	C_2H_5-	CH_3O-
142	$n\text{-}C_3H_7$-	CH_3O-
143	$n\text{-}C_4H_9$-	CH_3O-
144	$n\text{-}C_5H_{11}$-	CH_3O-
145	$n\text{-}C_6H_{13}$-	CH_3O-
146	$n\text{-}C_7H_{15}$-	CH_3O-
147	$n\text{-}C_8H_{17}$-	CH_3O-
148	C_2H_5-	C_2H_5O-
149	$n\text{-}C_3H_7$-	C_2H_5O-
150	$n\text{-}C_4H_9$-	C_2H_5O-
151	$n\text{-}C_5H_{11}$-	C_2H_5O-
152	$n\text{-}C_6H_{13}$-	C_2H_5O-
153	$n\text{-}C_7H_{15}$-	C_2H_5O-
154	$n\text{-}C_8H_{17}$-	C_2H_5O-
155	C_2H_5-	$n\text{-}C_3H_7O$-
156	$n\text{-}C_3H_7$-	$n\text{-}C_3H_7O$-
157	$n\text{-}C_4H_9$-	$n\text{-}C_3H_7O$-
158	$n\text{-}C_5H_{11}$-	$n\text{-}C_3H_7O$-
159	$n\text{-}C_6H_{13}$-	$n\text{-}C_3H_7O$-
160	$n\text{-}C_7H_{15}$-	$n\text{-}C_3H_7O$-
161	$n\text{-}C_8H_{17}$-	$n\text{-}C_3H_7O$-
162	C_2H_5-	$n\text{-}C_4H_9O$-

No.	R	R'
163	$n\text{-}C_3H_7-$	$n\text{-}C_4H_9O-$
164	$n\text{-}C_4H_9-$	$n\text{-}C_4H_9O-$
165	$n\text{-}C_5H_{11}-$	$n\text{-}C_4H_9O-$
166	$n\text{-}C_6H_{13}-$	$n\text{-}C_4H_9O-$
167	$n\text{-}C_7H_{15}-$	$n\text{-}C_4H_9O-$
168	$n\text{-}C_8H_{17}-$	$n\text{-}C_4H_9O-$
169	C_2H_5-	$n\text{-}C_5H_{11}O-$
170	$n\text{-}C_3H_7-$	$n\text{-}C_5H_{11}O-$
171	$n\text{-}C_4H_9-$	$n\text{-}C_5H_{11}O-$
172	$n\text{-}C_5H_{11}-$	$n\text{-}C_5H_{11}O-$
173	$n\text{-}C_6H_{13}-$	$n\text{-}C_5H_{11}O-$
174	$n\text{-}C_7H_{15}-$	$n\text{-}C_5H_{11}O-$
175	$n\text{-}C_8H_{17}-$	$n\text{-}C_5H_{11}O-$
176	C_2H_5-	$n\text{-}C_6H_{13}O-$
177	$n\text{-}C_3H_7-$	$n\text{-}C_6H_{13}O-$
178	$n\text{-}C_4H_9-$	$n\text{-}C_6H_{13}O-$
179	$n\text{-}C_5H_{11}-$	$n\text{-}C_6H_{13}O-$
180	$n\text{-}C_6H_{13}-$	$n\text{-}C_6H_{13}O-$
181	$n\text{-}C_7H_{15}-$	$n\text{-}C_6H_{13}O-$
182	$n\text{-}C_8H_{17}-$	$n\text{-}C_6H_{13}O-$
183	C_2H_5-	$n\text{-}C_7H_{15}O-$
184	$n\text{-}C_3H_7-$	$n\text{-}C_7H_{15}O-$
185	$n\text{-}C_4H_9-$	$n\text{-}C_7H_{15}O-$
186	$n\text{-}C_5H_{11}-$	$n\text{-}C_7H_{15}O-$

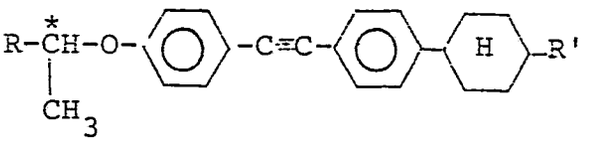
No.	R	R'
187	$n\text{-}C_6H_{13}$-	$n\text{-}C_7H_{15}O$-
188	$n\text{-}C_7H_{15}$-	$n\text{-}C_7H_{15}O$-
189	$n\text{-}C_8H_{17}$-	$n\text{-}C_7H_{15}O$-
190	C_2H_5-	$n\text{-}C_8H_{17}O$-
191	$n\text{-}C_3H_7$-	$n\text{-}C_8H_{17}O$-
192	$n\text{-}C_4H_9$-	$n\text{-}C_8H_{17}O$-
193	$n\text{-}C_5H_{11}$-	$n\text{-}C_8H_{17}O$-
194	$n\text{-}C_6H_{13}$-	$n\text{-}C_8H_{17}O$-
195	$n\text{-}C_7H_{15}$-	$n\text{-}C_8H_{17}O$-
196	$n\text{-}C_8H_{17}$-	$n\text{-}C_8H_{17}O$-
197	C_2H_5-	$n\text{-}C_9H_{19}O$-
198	$n\text{-}C_3H_7$-	$n\text{-}C_9H_{19}O$-
199	$n\text{-}C_4H_9$-	$n\text{-}C_9H_{19}O$-
200	$n\text{-}C_5H_{11}$-	$n\text{-}C_9H_{19}O$-
201	$n\text{-}C_6H_{13}$-	$n\text{-}C_9H_{19}O$-
202	$n\text{-}C_7H_{15}$-	$n\text{-}C_9H_{19}O$-
203	$n\text{-}C_8H_{17}$-	$n\text{-}C_9H_{19}O$-
204	C_2H_5-	$n\text{-}C_{10}H_{21}O$-
205	$n\text{-}C_3H_7$-	$n\text{-}C_{10}H_{21}O$-
206	$n\text{-}C_4H_9$-	$n\text{-}C_{10}H_{21}O$-
207	$n\text{-}C_5H_{11}$-	$n\text{-}C_{10}H_{21}O$-
208	$n\text{-}C_6H_{13}$-	$n\text{-}C_{10}H_{21}O$-
209	$n\text{-}C_7H_{15}$-	$n\text{-}C_{10}H_{21}O$-
210	$n\text{-}C_8H_{17}$-	$n\text{-}C_{10}H_{21}O$-

No.	R	R'
211	C_2H_5-	$n-C_{11}H_{23}O-$
212	$n-C_3H_7-$	$n-C_{11}H_{23}O-$
213	$n-C_4H_9-$	$n-C_{11}H_{23}O-$
214	$n-C_5H_{11}-$	$n-C_{11}H_{23}O-$
215	$n-C_6H_{13}-$	$n-C_{11}H_{23}O-$
216	$n-C_7H_{15}-$	$n-C_{11}H_{23}O-$
217	$n-C_8H_{17}-$	$n-C_{11}H_{23}O-$
218	C_2H_5-	$n-C_{12}H_{25}O-$
219	$n-C_3H_7-$	$n-C_{12}H_{25}O-$
220	$n-C_4H_9-$	$n-C_{12}H_{25}O-$
221	$n-C_5H_{11}-$	$n-C_{12}H_{25}O-$
222	$n-C_6H_{13}-$	$n-C_{12}H_{25}O-$
223	$n-C_7H_{15}-$	$n-C_{12}H_{25}O-$
224	$n-C_8H_{17}-$	$n-C_{12}H_{25}O-$
225	C_2H_5-	$n-C_{13}H_{27}O-$
226	$n-C_3H_7-$	$n-C_{13}H_{27}O-$
227	$n-C_4H_9-$	$n-C_{13}H_{27}O-$
228	$n-C_5H_{11}-$	$n-C_{13}H_{27}O-$
229	$n-C_6H_{13}-$	$n-C_{13}H_{27}O-$
230	$n-C_7H_{15}-$	$n-C_{13}H_{27}O-$
231	$n-C_8H_{17}-$	$n-C_{13}H_{27}O-$
232	C_2H_5-	$n-C_{14}H_{29}O-$
233	$n-C_3H_7-$	$n-C_{14}H_{29}O-$
234	$n-C_4H_9-$	$n-C_{14}H_{29}O-$

No.	R	R'
235	$n\text{-}C_5H_{11}$-	$n\text{-}C_{14}H_{29}O$-
236	$n\text{-}C_6H_{13}$-	$n\text{-}C_{14}H_{29}O$-
237	$n\text{-}C_7H_{15}$-	$n\text{-}C_{14}H_{29}O$-
238	$n\text{-}C_8H_{17}$-	$n\text{-}C_{14}H_{29}O$-
239	C_2H_5-	$n\text{-}C_{15}H_{31}O$-
240	$n\text{-}C_3H_7$-	$n\text{-}C_{15}H_{31}O$-
241	$n\text{-}C_4H_9$-	$n\text{-}C_{15}H_{31}O$-
242	$n\text{-}C_5H_{11}$-	$n\text{-}C_{15}H_{31}O$-
243	$n\text{-}C_6H_{13}$-	$n\text{-}C_{15}H_{31}O$-
244	$n\text{-}C_7H_{15}$-	$n\text{-}C_{15}H_{31}O$-
245	$n\text{-}C_8H_{17}$-	$n\text{-}C_{15}H_{31}O$-
246	C_2H_5-	$n\text{-}C_{16}H_{33}O$-
247	$n\text{-}C_3H_7$-	$n\text{-}C_{16}H_{33}O$-
248	$n\text{-}C_4H_9$-	$n\text{-}C_{16}H_{33}O$-
249	$n\text{-}C_5H_{11}$-	$n\text{-}C_{16}H_{33}O$-
250	$n\text{-}C_6H_{13}$-	$n\text{-}C_{16}H_{33}O$-
251	$n\text{-}C_7H_{15}$-	$n\text{-}C_{16}H_{33}O$-
252	$n\text{-}C_8H_{17}$-	$n\text{-}C_{16}H_{33}O$-
253	C_2H_5-	$n\text{-}C_{17}H_{35}O$-
254	$n\text{-}C_3H_7$-	$n\text{-}C_{17}H_{35}O$-
255	$n\text{-}C_4H_9$-	$n\text{-}C_{17}H_{35}O$-
256	$n\text{-}C_5H_{11}$-	$n\text{-}C_{17}H_{35}O$-
257	$n\text{-}C_6H_{13}$-	$n\text{-}C_{17}H_{35}O$-
258	$n\text{-}C_7H_{15}$-	$n\text{-}C_{17}H_{35}O$-

No.	R	R'
259	$n\text{-}C_8H_{17}$-	$n\text{-}C_{17}H_{35}O$-
260	C_2H_5-	$n\text{-}C_{18}H_{37}O$-
261	$n\text{-}C_3H_7$-	$n\text{-}C_{18}H_{37}O$-
262	$n\text{-}C_4H_9$-	$n\text{-}C_{18}H_{37}O$-
263	$n\text{-}C_5H_{11}$-	$n\text{-}C_{18}H_{37}O$-
264	$n\text{-}C_6H_{13}$-	$n\text{-}C_{18}H_{37}O$-
265	$n\text{-}C_7H_{15}$-	$n\text{-}C_{18}H_{37}O$-
266	$n\text{-}C_8H_{17}$-	$n\text{-}C_{18}H_{37}O$-
267	C_2H_5-	$n\text{-}C_{19}H_{39}O$-
268	$n\text{-}C_3H_7$-	$n\text{-}C_{19}H_{39}O$-
269	$n\text{-}C_4H_9$-	$n\text{-}C_{19}H_{39}O$-
270	$n\text{-}C_5H_{11}$-	$n\text{-}C_{19}H_{39}O$-
271	$n\text{-}C_6H_{13}$-	$n\text{-}C_{19}H_{39}O$-
272	$n\text{-}C_7H_{15}$-	$n\text{-}C_{19}H_{39}O$-
273	$n\text{-}C_8H_{17}$-	$n\text{-}C_{19}H_{39}O$-
274	C_2H_5-	$n\text{-}C_{20}H_{41}O$-
275	$n\text{-}C_3H_7$-	$n\text{-}C_{20}H_{41}O$-
276	$n\text{-}C_4H_9$-	$n\text{-}C_{20}H_{41}O$-
277	$n\text{-}C_5H_{11}$-	$n\text{-}C_{20}H_{41}O$-
278	$n\text{-}C_6H_{13}$-	$n\text{-}C_{20}H_{41}O$-
279	$n\text{-}C_7H_{15}$-	$n\text{-}C_{20}H_{41}O$-
280	$n\text{-}C_8H_{17}$-	$n\text{-}C_{20}H_{41}O$-

TABLE 2



No.	R	R'
281	C_2H_5-	CH_3-
282	n-C_3H_7-	CH_3-
283	n-C_4H_9-	CH_3-
284	n-C_5H_{11}-	CH_3-
285	n-C_6H_{13}-	CH_3-
286	n-C_7H_{15}-	CH_3-
287	n-C_8H_{17}-	CH_3-
288	C_2H_5-	C_2H_5-
289	n-C_3H_7-	C_2H_5-
290	n-C_4H_9-	C_2H_5-
291	n-C_5H_{11}-	C_2H_5-
292	n-C_6H_{13}-	C_2H_5-
293	n-C_7H_{15}-	C_2H_5-
294	n-C_8H_{17}-	C_2H_5-
295	C_2H_5-	n-C_3H_7-
296	n-C_3H_7-	n-C_3H_7-
297	n-C_4H_9-	n-C_3H_7-
298	n-C_5H_{11}-	n-C_3H_7-

No.	R	R'
299	$n\text{-}C_6H_{13}$-	$n\text{-}C_3H_7$-
300	$n\text{-}C_7H_{15}$-	$n\text{-}C_3H_7$-
301	$n\text{-}C_8H_{17}$-	$n\text{-}C_3H_7$-
302	C_2H_5-	$n\text{-}C_4H_9$-
303	$n\text{-}C_3H_7$-	$n\text{-}C_4H_9$-
304	$n\text{-}C_4H_9$-	$n\text{-}C_4H_9$-
305	$n\text{-}C_5H_{11}$-	$n\text{-}C_4H_9$-
306	$n\text{-}C_6H_{13}$-	$n\text{-}C_4H_9$-
307	$n\text{-}C_7H_{15}$-	$n\text{-}C_4H_9$-
308	$n\text{-}C_8H_{17}$-	$n\text{-}C_4H_9$-
309	C_2H_5-	$n\text{-}C_5H_{11}$-
310	$n\text{-}C_3H_7$-	$n\text{-}C_5H_{11}$-
311	$n\text{-}C_4H_9$-	$n\text{-}C_5H_{11}$-
312	$n\text{-}C_5H_{11}$-	$n\text{-}C_5H_{11}$-
313	$n\text{-}C_6H_{13}$-	$n\text{-}C_5H_{11}$-
314	$n\text{-}C_7H_{15}$-	$n\text{-}C_5H_{11}$-
315	$n\text{-}C_8H_{17}$-	$n\text{-}C_5H_{11}$-
316	C_2H_5-	$n\text{-}C_6H_{13}$-
317	$n\text{-}C_3H_7$-	$n\text{-}C_6H_{13}$-
318	$n\text{-}C_4H_9$-	$n\text{-}C_6H_{13}$-
319	$n\text{-}C_5H_{11}$-	$n\text{-}C_6H_{13}$-
320	$n\text{-}C_6H_{13}$-	$n\text{-}C_6H_{13}$-
321	$n\text{-}C_7H_{15}$-	$n\text{-}C_6H_{13}$-
322	$n\text{-}C_8H_{17}$-	$n\text{-}C_6H_{13}$-

No.	R	R'
323	C_2H_5-	n-C_7H_{15}-
324	n-C_3H_7-	n-C_7H_{15}-
325	n-C_4H_9-	n-C_7H_{15}-
326	n-C_5H_{11}-	n-C_7H_{15}-
327	n-C_6H_{13}-	n-C_7H_{15}-
328	n-C_7H_{15}-	n-C_7H_{15}-
329	n-C_8H_{17}-	n-C_7H_{15}-
330	C_2H_5-	n-C_8H_{17}-
331	n-C_3H_7-	n-C_8H_{17}-
332	n-C_4H_9-	n-C_8H_{17}-
333	n-C_5H_{11}-	n-C_8H_{17}-
334	n-C_6H_{13}-	n-C_8H_{17}-
335	n-C_7H_{15}-	n-C_8H_{17}-
336	n-C_8H_{17}-	n-C_8H_{17}-
337	C_2H_5-	n-C_9H_{19}-
338	n-C_3H_7-	n-C_9H_{19}-
339	n-C_4H_9-	n-C_9H_{19}-
340	n-C_5H_{11}-	n-C_9H_{19}-
341	n-C_6H_{13}-	n-C_9H_{19}-
342	n-C_7H_{15}-	n-C_9H_{19}-
343	n-C_8H_{17}-	n-C_9H_{19}-
344	C_2H_5-	n-$C_{10}H_{21}$-
345	n-C_3H_7-	n-$C_{10}H_{21}$-
346	n-C_4H_9-	n-$C_{10}H_{21}$-

No.	R	R'
347	$n\text{-}C_5H_{11}$-	$n\text{-}C_{10}H_{21}$-
348	$n\text{-}C_6H_{13}$-	$n\text{-}C_{10}H_{21}$-
349	$n\text{-}C_7H_{15}$-	$n\text{-}C_{10}H_{21}$-
350	$n\text{-}C_8H_{17}$-	$n\text{-}C_{10}H_{21}$-
351	C_2H_5-	$n\text{-}C_{11}H_{23}$-
352	$n\text{-}C_3H_7$-	$n\text{-}C_{11}H_{23}$-
353	$n\text{-}C_4H_9$-	$n\text{-}C_{11}H_{23}$-
354	$n\text{-}C_5H_{11}$-	$n\text{-}C_{11}H_{23}$-
355	$n\text{-}C_6H_{13}$-	$n\text{-}C_{11}H_{23}$-
356	$n\text{-}C_7H_{15}$-	$n\text{-}C_{11}H_{23}$-
357	$n\text{-}C_8H_{17}$-	$n\text{-}C_{11}H_{23}$-
358	C_2H_5-	$n\text{-}C_{12}H_{25}$-
359	$n\text{-}C_3H_7$-	$n\text{-}C_{12}H_{25}$-
360	$n\text{-}C_4H_9$-	$n\text{-}C_{12}H_{25}$-
361	$n\text{-}C_5H_{11}$-	$n\text{-}C_{12}H_{25}$-
362	$n\text{-}C_6H_{13}$-	$n\text{-}C_{12}H_{25}$-
363	$n\text{-}C_7H_{15}$-	$n\text{-}C_{12}H_{25}$-
364	$n\text{-}C_8H_{17}$-	$n\text{-}C_{12}H_{25}$-
365	C_2H_5-	$n\text{-}C_{13}H_{27}$-
366	$n\text{-}C_3H_7$-	$n\text{-}C_{13}H_{27}$-
367	$n\text{-}C_4H_9$-	$n\text{-}C_{13}H_{27}$-
368	$n\text{-}C_5H_{11}$-	$n\text{-}C_{13}H_{27}$-
369	$n\text{-}C_6H_{13}$-	$n\text{-}C_{13}H_{27}$-
370	$n\text{-}C_7H_{15}$-	$n\text{-}C_{13}H_{27}$-

No.	R	R'
371	$n\text{-}C_8H_{17}$-	$n\text{-}C_{13}H_{27}$-
372	C_2H_5-	$n\text{-}C_{14}H_{29}$-
373	$n\text{-}C_3H_7$-	$n\text{-}C_{14}H_{29}$-
374	$n\text{-}C_4H_9$-	$n\text{-}C_{14}H_{29}$-
375	$n\text{-}C_5H_{11}$-	$n\text{-}C_{14}H_{29}$-
376	$n\text{-}C_6H_{13}$-	$n\text{-}C_{14}H_{29}$-
377	$n\text{-}C_7H_{15}$-	$n\text{-}C_{14}H_{29}$-
378	$n\text{-}C_8H_{17}$-	$n\text{-}C_{14}H_{29}$-
379	C_2H_5-	$n\text{-}C_{15}H_{31}$-
380	$n\text{-}C_3H_7$-	$n\text{-}C_{15}H_{31}$-
381	$n\text{-}C_4H_9$-	$n\text{-}C_{15}H_{31}$-
382	$n\text{-}C_5H_{11}$-	$n\text{-}C_{15}H_{31}$-
383	$n\text{-}C_6H_{13}$-	$n\text{-}C_{15}H_{31}$-
384	$n\text{-}C_7H_{15}$-	$n\text{-}C_{15}H_{31}$-
385	$n\text{-}C_8H_{17}$-	$n\text{-}C_{15}H_{31}$-
386	C_2H_5-	$n\text{-}C_{16}H_{33}$-
387	$n\text{-}C_3H_7$-	$n\text{-}C_{16}H_{33}$-
388	$n\text{-}C_4H_9$-	$n\text{-}C_{16}H_{33}$-
389	$n\text{-}C_5H_{11}$-	$n\text{-}C_{16}H_{33}$-
390	$n\text{-}C_6H_{13}$-	$n\text{-}C_{16}H_{33}$-
391	$n\text{-}C_7H_{15}$-	$n\text{-}C_{16}H_{33}$-
392	$n\text{-}C_8H_{17}$-	$n\text{-}C_{16}H_{33}$-
393	C_2H_5-	$n\text{-}C_{17}H_{35}$-
394	$n\text{-}C_3H_7$-	$n\text{-}C_{17}H_{35}$-

No.	R	R'
395	$n\text{-}C_4H_9$-	$n\text{-}C_{17}H_{35}$-
396	$n\text{-}C_5H_{11}$-	$n\text{-}C_{17}H_{35}$-
397	$n\text{-}C_6H_{13}$-	$n\text{-}C_{17}H_{35}$-
398	$n\text{-}C_7H_{15}$-	$n\text{-}C_{17}H_{35}$-
399	$n\text{-}C_8H_{17}$-	$n\text{-}C_{17}H_{35}$-
400	C_2H_5-	$n\text{-}C_{18}H_{37}$-
401	$n\text{-}C_3H_7$-	$n\text{-}C_{18}H_{37}$-
402	$n\text{-}C_4H_9$-	$n\text{-}C_{18}H_{37}$-
403	$n\text{-}C_5H_{11}$-	$n\text{-}C_{18}H_{37}$-
404	$n\text{-}C_6H_{13}$-	$n\text{-}C_{18}H_{37}$-
405	$n\text{-}C_7H_{15}$-	$n\text{-}C_{18}H_{37}$-
406	$n\text{-}C_8H_{17}$-	$n\text{-}C_{18}H_{37}$-
407	C_2H_5-	$n\text{-}C_{19}H_{39}$-
408	$n\text{-}C_3H_7$-	$n\text{-}C_{19}H_{39}$-
409	$n\text{-}C_4H_9$-	$n\text{-}C_{19}H_{39}$-
410	$n\text{-}C_5H_{11}$-	$n\text{-}C_{19}H_{39}$-
411	$n\text{-}C_6H_{13}$-	$n\text{-}C_{19}H_{39}$-
412	$n\text{-}C_7H_{15}$-	$n\text{-}C_{19}H_{39}$-
413	$n\text{-}C_8H_{17}$-	$n\text{-}C_{19}H_{39}$-
414	C_2H_5-	$n\text{-}C_{20}H_{41}$-
415	$n\text{-}C_3H_7$-	$n\text{-}C_{20}H_{41}$-
416	$n\text{-}C_4H_9$-	$n\text{-}C_{20}H_{41}$-
417	$n\text{-}C_5H_{11}$-	$n\text{-}C_{20}H_{41}$-
418	$n\text{-}C_6H_{13}$-	$n\text{-}C_{20}H_{41}$-

No.	R	R'
419	$n\text{-}C_7H_{15}-$	$n\text{-}C_{20}H_{41}-$
420	$n\text{-}C_8H_{17}-$	$n\text{-}C_{20}H_{41}-$
421	C_2H_5-	CH_3O-
422	$n\text{-}C_3H_7-$	CH_3O-
423	$n\text{-}C_4H_9-$	CH_3O-
424	$n\text{-}C_5H_{11}-$	CH_3O-
425	$n\text{-}C_6H_{13}-$	CH_3O-
426	$n\text{-}C_7H_{15}-$	CH_3O-
427	$n\text{-}C_8H_{17}-$	CH_3O-
428	C_2H_5-	C_2H_5O-
429	$n\text{-}C_3H_7-$	C_2H_5O-
430	$n\text{-}C_4H_9-$	C_2H_5O-
431	$n\text{-}C_5H_{11}-$	C_2H_5O-
432	$n\text{-}C_6H_{13}-$	C_2H_5O-
433	$n\text{-}C_7H_{15}-$	C_2H_5O-
434	$n\text{-}C_8H_{17}-$	C_2H_5O-
435	C_2H_5-	$n\text{-}C_3H_7O-$
436	$n\text{-}C_3H_7-$	$n\text{-}C_3H_7O-$
437	$n\text{-}C_4H_9-$	$n\text{-}C_3H_7O-$
438	$n\text{-}C_5H_{11}-$	$n\text{-}C_3H_7O-$
439	$n\text{-}C_6H_{13}-$	$n\text{-}C_3H_7O-$
440	$n\text{-}C_7H_{15}-$	$n\text{-}C_3H_7O-$
441	$n\text{-}C_8H_{17}-$	$n\text{-}C_3H_7O-$
442	C_2H_5-	$n\text{-}C_4H_9O-$

No.	R	R'
443	n-C_3H_7-	n-C_4H_9O-
444	n-C_4H_9-	n-C_4H_9O-
445	n-C_5H_{11}-	n-C_4H_9O-
446	n-C_6H_{13}-	n-C_4H_9O-
447	n-C_7H_{15}-	n-C_4H_9O-
448	n-C_8H_{17}-	n-C_4H_9O-
449	C_2H_5-	n-$C_5H_{11}O$-
450	n-C_3H_7-	n-$C_5H_{11}O$-
451	n-C_4H_9-	n-$C_5H_{11}O$-
452	n-C_5H_{11}-	n-$C_5H_{11}O$-
453	n-C_6H_{13}-	n-$C_5H_{11}O$-
454	n-C_7H_{15}-	n-$C_5H_{11}O$-
455	n-C_8H_{17}-	n-$C_5H_{11}O$-
456	C_2H_5-	n-$C_6H_{13}O$-
457	n-C_3H_7-	n-$C_6H_{13}O$-
458	n-C_4H_9-	n-$C_6H_{13}O$-
459	n-C_5H_{11}-	n-$C_6H_{13}O$-
460	n-C_6H_{13}-	n-$C_6H_{13}O$-
461	n-C_7H_{15}-	n-$C_6H_{13}O$-
462	n-C_8H_{17}-	n-$C_6H_{13}O$-
463	C_2H_5-	n-$C_7H_{15}O$-
464	n-C_3H_7-	n-$C_7H_{15}O$-
465	n-C_4H_9-	n-$C_7H_{15}O$-
466	n-C_5H_{11}-	n-$C_7H_{15}O$-

No.	R	R'
467	$n\text{-}C_6H_{13}$-	$n\text{-}C_7H_{15}O$-
468	$n\text{-}C_7H_{15}$-	$n\text{-}C_7H_{15}O$-
469	$n\text{-}C_8H_{17}$-	$n\text{-}C_7H_{15}O$-
470	C_2H_5-	$n\text{-}C_8H_{17}O$-
471	$n\text{-}C_3H_7$-	$n\text{-}C_8H_{17}O$-
472	$n\text{-}C_4H_9$-	$n\text{-}C_8H_{17}O$-
473	$n\text{-}C_5H_{11}$-	$n\text{-}C_8H_{17}O$-
474	$n\text{-}C_6H_{13}$-	$n\text{-}C_8H_{17}O$-
475	$n\text{-}C_7H_{15}$-	$n\text{-}C_8H_{17}O$-
476	$n\text{-}C_8H_{17}$-	$n\text{-}C_8H_{17}O$-
477	C_2H_5-	$n\text{-}C_9H_{19}O$-
478	$n\text{-}C_3H_7$-	$n\text{-}C_9H_{19}O$-
479	$n\text{-}C_4H_9$-	$n\text{-}C_9H_{19}O$-
480	$n\text{-}C_5H_{11}$-	$n\text{-}C_9H_{19}O$-
481	$n\text{-}C_6H_{13}$-	$n\text{-}C_9H_{19}O$-
482	$n\text{-}C_7H_{15}$-	$n\text{-}C_9H_{19}O$-
483	$n\text{-}C_8H_{17}$-	$n\text{-}C_9H_{19}O$-
484	C_2H_5-	$n\text{-}C_{10}H_{21}O$-
485	$n\text{-}C_3H_7$-	$n\text{-}C_{10}H_{21}O$-
486	$n\text{-}C_4H_9$-	$n\text{-}C_{10}H_{21}O$-
487	$n\text{-}C_5H_{11}$-	$n\text{-}C_{10}H_{21}O$-
488	$n\text{-}C_6H_{13}$-	$n\text{-}C_{10}H_{21}O$-
489	$n\text{-}C_7H_{15}$-	$n\text{-}C_{10}H_{21}O$-
490	$n\text{-}C_8H_{17}$-	$n\text{-}C_{10}H_{21}O$-

No.	R	R'
491	C_2H_5-	n-$C_{11}H_{23}O$-
492	n-C_3H_7-	n-$C_{11}H_{23}O$-
493	n-C_4H_9-	n-$C_{11}H_{23}O$-
494	n-C_5H_{11}-	n-$C_{11}H_{23}O$-
495	n-C_6H_{13}-	n-$C_{11}H_{23}O$-
496	n-C_7H_{15}-	n-$C_{11}H_{23}O$-
497	n-C_8H_{17}-	n-$C_{11}H_{23}O$-
498	C_2H_5-	n-$C_{12}H_{25}O$-
499	n-C_3H_7-	n-$C_{12}H_{25}O$-
500	n-C_4H_9-	n-$C_{12}H_{25}O$-
501	n-C_5H_{11}-	n-$C_{12}H_{25}O$-
502	n-C_6H_{13}-	n-$C_{12}H_{25}O$-
503	n-C_7H_{15}-	n-$C_{12}H_{25}O$-
504	n-C_8H_{17}-	n-$C_{12}H_{25}O$-
505	C_2H_5-	n-$C_{13}H_{27}O$-
506	n-C_3H_7-	n-$C_{13}H_{27}O$-
507	n-C_4H_9-	n-$C_{13}H_{27}O$-
508	n-C_5H_{11}-	n-$C_{13}H_{27}O$-
509	n-C_6H_{13}-	n-$C_{13}H_{27}O$-
510	n-C_7H_{15}-	n-$C_{13}H_{27}O$-
511	n-C_8H_{17}-	n-$C_{13}H_{27}O$-
512	C_2H_5-	n-$C_{14}H_{29}O$-
513	n-C_3H_7-	n-$C_{14}H_{29}O$-
514	n-C_4H_9-	n-$C_{14}H_{29}O$-

No.	R	R'
515	$n\text{-}C_5H_{11}$-	$n\text{-}C_{14}H_{29}O$-
516	$n\text{-}C_6H_{13}$-	$n\text{-}C_{14}H_{29}O$-
517	$n\text{-}C_7H_{15}$-	$n\text{-}C_{14}H_{29}O$-
518	$n\text{-}C_8H_{17}$-	$n\text{-}C_{14}H_{29}O$-
519	C_2H_5-	$n\text{-}C_{15}H_{31}O$-
520	$n\text{-}C_3H_7$-	$n\text{-}C_{15}H_{31}O$-
521	$n\text{-}C_4H_9$-	$n\text{-}C_{15}H_{31}O$-
522	$n\text{-}C_5H_{11}$-	$n\text{-}C_{15}H_{31}O$-
523	$n\text{-}C_6H_{13}$-	$n\text{-}C_{15}H_{31}O$-
524	$n\text{-}C_7H_{15}$-	$n\text{-}C_{15}H_{31}O$-
525	$n\text{-}C_8H_{17}$-	$n\text{-}C_{15}H_{31}O$-
526	C_2H_5-	$n\text{-}C_{16}H_{33}O$-
527	$n\text{-}C_3H_7$-	$n\text{-}C_{16}H_{33}O$-
528	$n\text{-}C_4H_9$-	$n\text{-}C_{16}H_{33}O$-
529	$n\text{-}C_5H_{11}$-	$n\text{-}C_{16}H_{33}O$-
530	$n\text{-}C_6H_{13}$-	$n\text{-}C_{16}H_{33}O$-
531	$n\text{-}C_7H_{15}$-	$n\text{-}C_{16}H_{33}O$-
532	$n\text{-}C_8H_{17}$-	$n\text{-}C_{16}H_{33}O$-
533	C_2H_5-	$n\text{-}C_{17}H_{35}O$-
534	$n\text{-}C_3H_7$-	$n\text{-}C_{17}H_{35}O$-
535	$n\text{-}C_4H_9$-	$n\text{-}C_{17}H_{35}O$-
536	$n\text{-}C_5H_{11}$-	$n\text{-}C_{17}H_{35}O$-
537	$n\text{-}C_6H_{13}$-	$n\text{-}C_{17}H_{35}O$-
538	$n\text{-}C_7H_{15}$-	$n\text{-}C_{17}H_{35}O$-

No.	R	R'
539	$n\text{-}C_8H_{17}$-	$n\text{-}C_{17}H_{35}O$-
540	C_2H_5-	$n\text{-}C_{18}H_{37}O$-
541	$n\text{-}C_3H_7$-	$n\text{-}C_{18}H_{37}O$-
542	$n\text{-}C_4H_9$-	$n\text{-}C_{18}H_{37}O$-
543	$n\text{-}C_5H_{11}$-	$n\text{-}C_{18}H_{37}O$-
544	$n\text{-}C_6H_{13}$-	$n\text{-}C_{18}H_{37}O$-
545	$n\text{-}C_7H_{15}$-	$n\text{-}C_{18}H_{37}O$-
546	$n\text{-}C_8H_{17}$-	$n\text{-}C_{18}H_{37}O$-
547	C_2H_5-	$n\text{-}C_{19}H_{39}O$-
548	$n\text{-}C_3H_7$-	$n\text{-}C_{19}H_{39}O$-
549	$n\text{-}C_4H_9$-	$n\text{-}C_{19}H_{39}O$-
550	$n\text{-}C_5H_{11}$-	$n\text{-}C_{19}H_{39}O$-
551	$n\text{-}C_6H_{13}$-	$n\text{-}C_{19}H_{39}O$-
552	$n\text{-}C_7H_{15}$-	$n\text{-}C_{19}H_{39}O$-
553	$n\text{-}C_8H_{17}$-	$n\text{-}C_{19}H_{39}O$-
554	C_2H_5-	$n\text{-}C_{20}H_{41}O$-
555	$n\text{-}C_3H_7$-	$n\text{-}C_{20}H_{41}O$-
556	$n\text{-}C_4H_9$-	$n\text{-}C_{20}H_{41}O$-
557	$n\text{-}C_5H_{11}$-	$n\text{-}C_{20}H_{41}O$-
558	$n\text{-}C_6H_{13}$-	$n\text{-}C_{20}H_{41}O$-
559	$n\text{-}C_7H_{15}$-	$n\text{-}C_{20}H_{41}O$-
560	$n\text{-}C_8H_{17}$-	$n\text{-}C_{20}H_{41}O$-

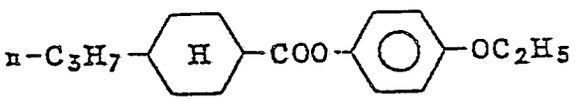
In the general formula (I), the sum of the number of carbon atoms contained in the alkyl group represented by R and the number of carbon atoms contained in the alkyl or alkoxy group represented by R' is preferably 3 to 20. Compounds of the general formula (I) wherein n represents O, R represents a straight alkyl group having 2 to 8 carbon atoms, and R' represents a straight alkyl group having 1 to 12 carbon atoms, or wherein n represents O, R represents a straight alkyl group having 2 to 8 carbon atoms, and R' represents a straight alkoxy group having 1 to 12 are preferred. In addition, compounds of the general formula (I) wherein n represents 1, R represents a straight alkyl group having 2 to 8 carbon atoms, and R' represents a straight alkyl group having 1 to 12 carbon atoms, or wherein n represents 1, R represents a straight alkyl group having 2 to 8 carbon atoms, and R' represents a straight alkoxy group having 1 to 12 carbon atoms are preferred.

Many nematic liquid crystal compositions commonly used at the present time can be sufficiently decreased in the temperature dependency of threshold voltage by adding the compounds of the general formula (I) of this invention only in small amounts.

Fig. 1 is a graph showing the temperature dependency of threshold voltage of each of a mixed liquid crystal (A) commonly used as a nematic liquid crystal material at the present time and of a chiral nematic liquid crystal composition as prepared by adding 0.14 wt% of Compound No. 33 (dextro rotation) of the present invention to the mixed liquid crystal (A). This chiral nematic liquid crystal composition has a pitch of 200 μm.

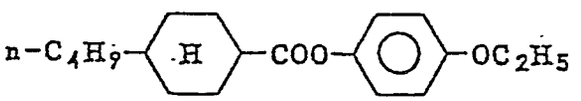
The mixed liquid crystal (A) is composed of:

11 wt% of



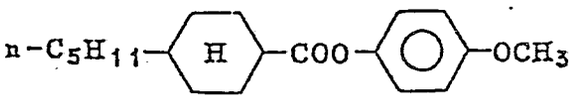
;

11 wt% of



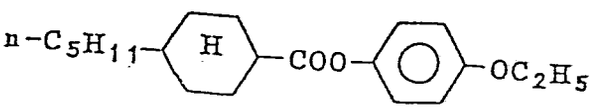
;

11 wt% of



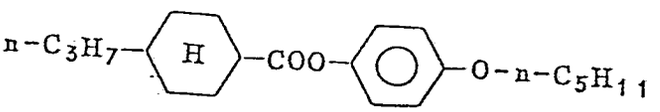
;

16 wt% of



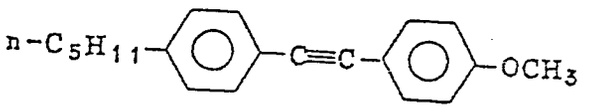
;

16 wt%



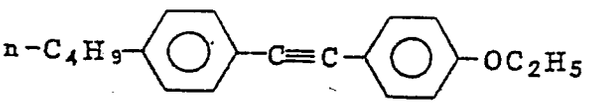
;

5 wt% of



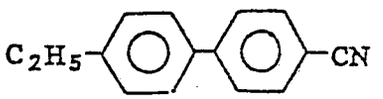
;

6 wt% of



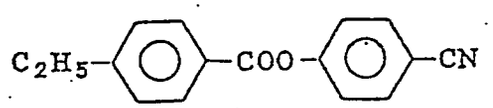
;

3 wt% of



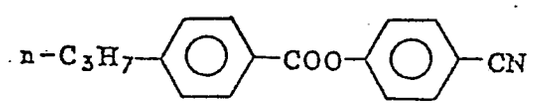
;

7 wt% of



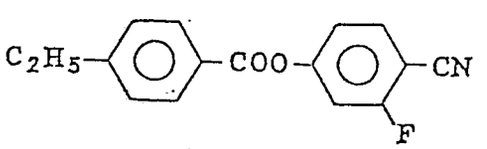
;

3 wt% of



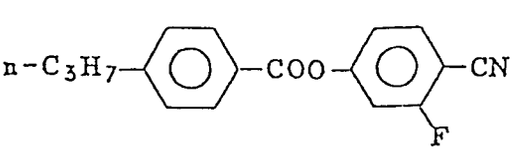
;

3 wt% of



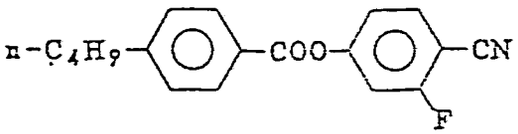
;

3 wt% of



;

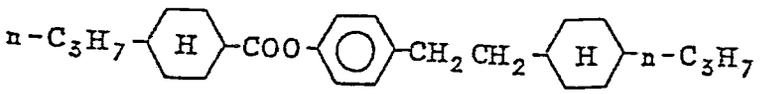
2 wt% of



;

and

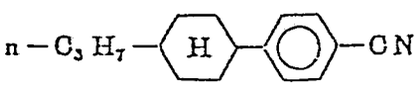
3 wt% of



;

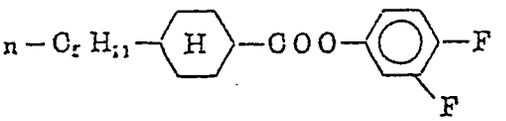
Fig. 2 is a graph showing the temperature dependency of threshold voltage of each of a mixed liquid crystal (B) commonly used as a nematic liquid crystal material and of a chiral nematic liquid crystal composition as prepared by adding 0.70 wt% of Compound No. 299 (dextro rotation) of the general formula (I) of the present invention to the mixed liquid crystal (B). This chiral nematic liquid crystal composition has a pitch of 100 μm.

The mixed liquid crystal (B) is composed of 13 wt% of



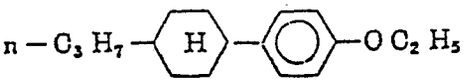
;

9 wt% of



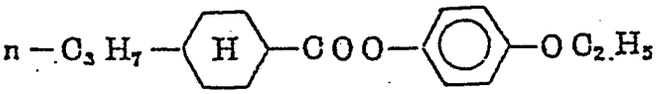
;

13 wt% of



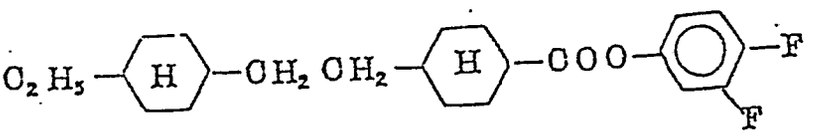
;

10 wt% of



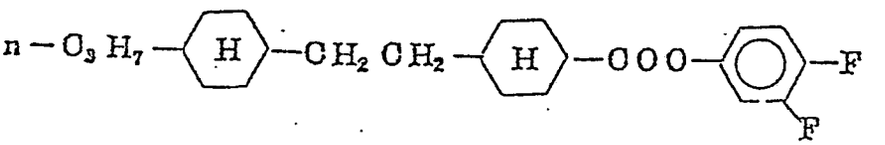
;

2 wt% of



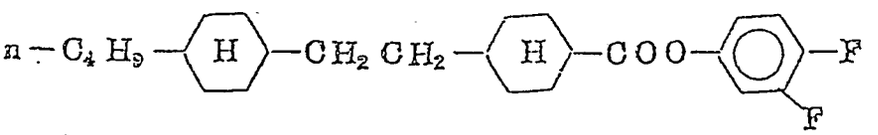
;

7 wt% of



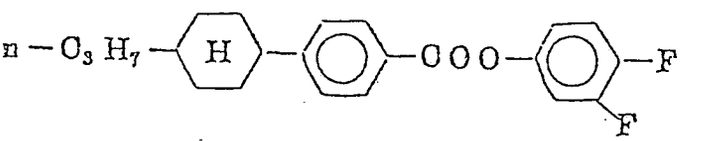
;

5 wt% of



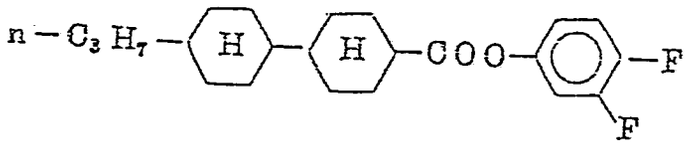
;

5 wt% of



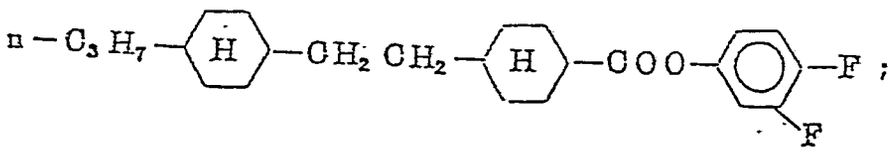
;

4 wt% of



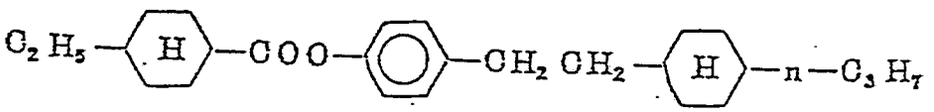
;

9 wt% of



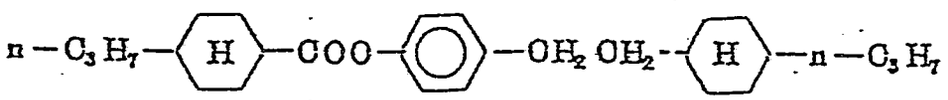
;

4 wt% of



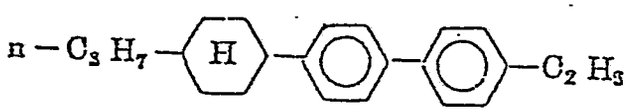
;

4 wt% of



;

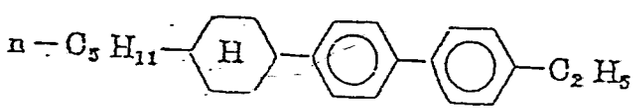
8 wt% of



;

and

7 wt% of



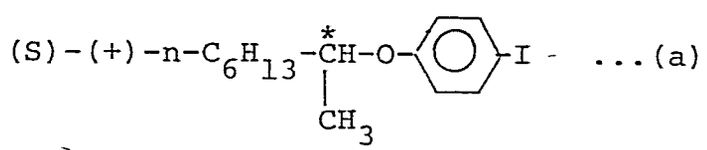
.

It can be seen that the compounds of the general formula (I) have an effect of decreasing the temperature dependency of threshold voltage of a nematic liquid crystal composition when added thereto in a small amount.

The present invention is described in greater detail with reference to the following examples.

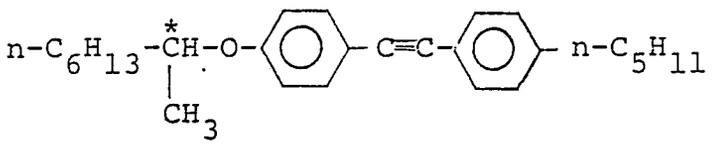
EXAMPLE 1

4.0 g (0.012 mol) of a compound having the formula (a):



...(a)

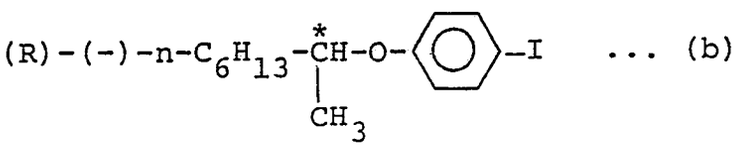
(wherein (S) indicates that the absolute arrangement with respect to a chiral center is sinister, and (+) indicates dextro rotation) was dissolved in 10 ml of diethylamine, and 24 mg (0.034 mmol) of bis-(triphenylphosphine)palladium (II) chloride and 60 mg (0.31 mmol) of copper (II) iodide were added thereto. To the resulting mixture was dropped 2.1 g (0.012 mole) of p-n-pentylphenylacetylene while stirring the mixture at room temperature. After the dropwise addition was completed, the mixture was stirred for about 7 hours at room temperature. After the completion of the reaction, the reaction mixture was added to an excessive amount of hydro-chloric acid cooled with ice, and the resulting mixture was extracted with toluene and then washed with water and dried, and further recrystallized from ethanol and purified to obtain 3.4 g (0.0090 mol) of a compound having the following formula:



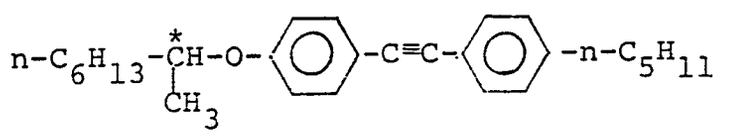
Yield: 75%
$[\alpha]_D^{25}$ = +3.7
Transition Temperature: 38°C (C→ I)
The symbol "C" indicates a crystal phase, and "I", and isometric liquid phase.

EXAMPLE 2

The procedure of Example 1 was repeated with the exception that a compound having the formula (b):



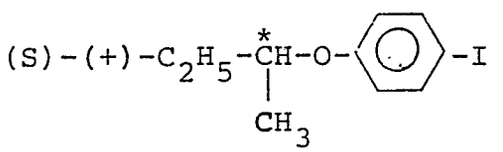
(wherein (R) indicates that the absolute arrangement with respect to a chiral center is rectus, and (-) indicates levo rotation) was used in place of the compound of the formula (a), to thereby obtain a compound having the following formula:



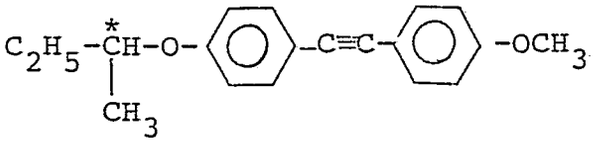
Yield: 58%
$[\alpha]_D^{25}$ -2.4
Transition temperature: 38°C (C → I)

EXAMPLE 3

The procedure of Example 1 was repeated with the exception that 3.3 g (0.012 mol) of a compound having the formula:



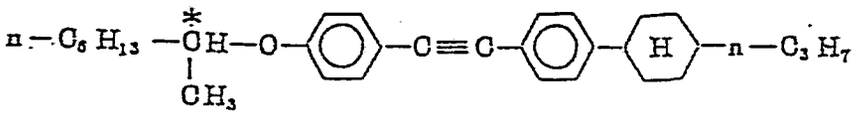
was used in place of the compound of the formula (a), and 1.6 g (0.012 mol) of p-methoxyphenylacetylene was used in place of the p-n-pentylphenylacetylene, to thereby obtain a compound having the formula:



Yield: 58%
$[\alpha]_D^{25}$ = -21.0°
Transition Temperature: 69°C (C → I)

EXAMPLE 4

The procedure of Example 1 was repeated with the exception that 2.7 g (0.012 mol) of 4-(trans-4'-n-propylcyclohexyl)phenylacetylene was used in place of the p-n-pentylphenylacetylene, to thereby a compound having the following formula:



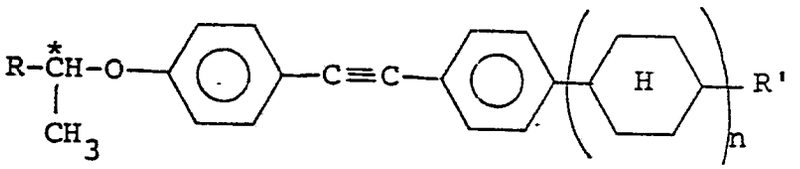
Yield: 65%
$[\alpha]_D^{25}$ = +1.80
Transition Temperature: 75°C (C → Ch)
117°C (Ch ⇌ I)

The symbol "C" indicates a crystal phase; "Ch", a colesteric phase; and "I", an isometric liquid phase.

The optically active compound of the present invention is a compound capable of decreasing the temperature dependency of threshold voltage of a nematic liquid crystal composition commonly used at the present time when added thereto in a small amount. Thus the optically active compound of the present invention is effective in preparation of liquid crystal material which is capable of effectively preventing the formation of the cross-talk phenomenon due to changes in the environmental temperature in high level multiplexing driving system.

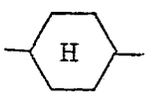
Claims

1. An optically active tolan derivative represented by formula,



(I)

(wherein R represents a straight alkyl group having 2 to 8 carbon atoms; R' represents a straight alkyl group having 1 to 20 carbon atoms or a straight alkoxy group having 1 to 20 carbon atoms; n represents 0 or 1;



represents a trans(equatorial-equatorial) cyclohexyl ring; and $\overset{*}{C}$ represents an asymmetrical carbon).

2. The optically active tolan derivative as in claim 1, wherein R' is a straight alkyl group having 1 to 20 carbon atoms; and n is 0.

3. The optically active tolan derivative as in claim 1, wherein R' is straight alkyl group having 1 to 20 carbon atoms; and n is 1.

4. The optically active tolan derivative as in claim 1, wherein R' is a straight alkoxy group having 1 to 20 carbon atoms; and n is 0.

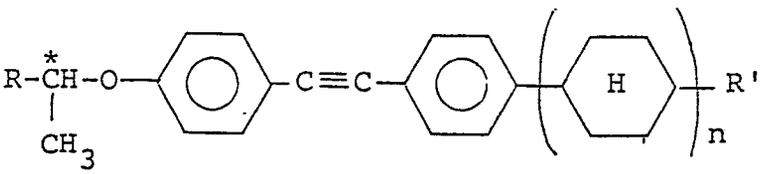
5. The optically active tolan derivative as in claim 1, wherein R′ is a straight alkoxy group having 1 to 20 carbon atoms; and n is 1.

6. The optically active tolan derivative as in claim 1, wherein R is n-C_6H_{13}; R′ is n-C_5H_{11}; and n is 0.

7. The optically active tolan derivative as in claim 1, wherein R is C_2H_5; R′ is O-CH_3; and n is 0.

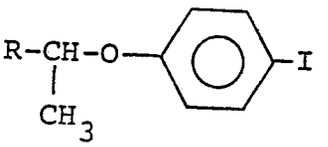
8. The optically active tolan derivative as in claim 1, wherein R is n-C_6H_{13}; R′ is n-C_3H_7; and n is 1.

9. A process for preparing an optically active tolan derivative of formula

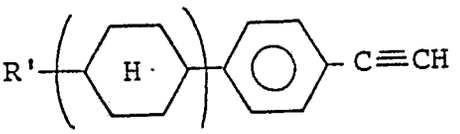


(I)

which comprises reacting a 4-iodophenyl-1′-methylalkylether of formula:

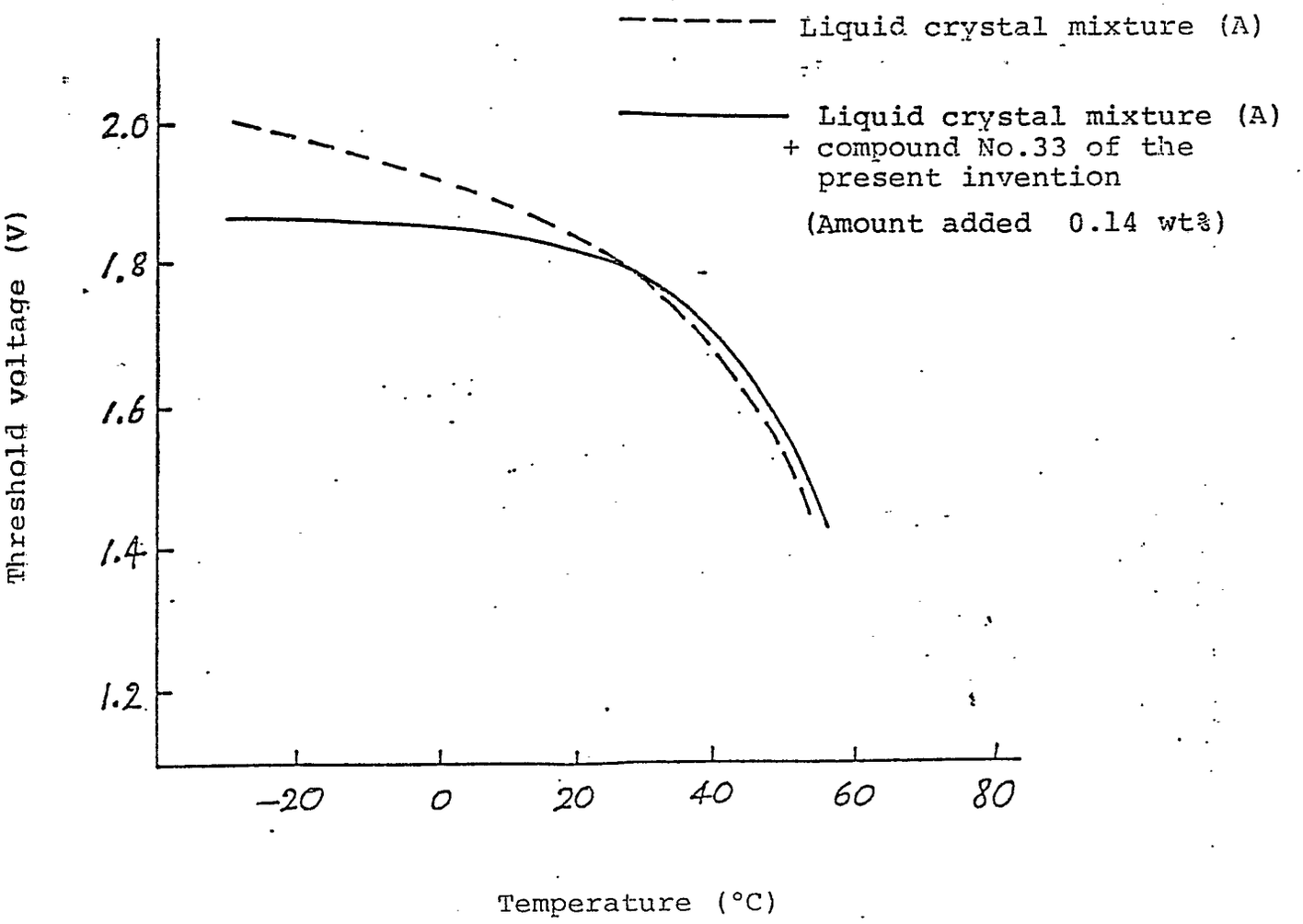


with a derivative of a phenylacetylene of formula:



in a solvent, in the present of a catalyst.

Fig. 1


Liquid crystal mixture (A)
Liquid crystal mixture (A) + compound No.33 of the present invention (Amount added 0.14 wt%)
Threshold voltage (V)
2.0
1.8
1.6
1.4
1.2
-20
0
20
40
60
80
Temperature (°C)

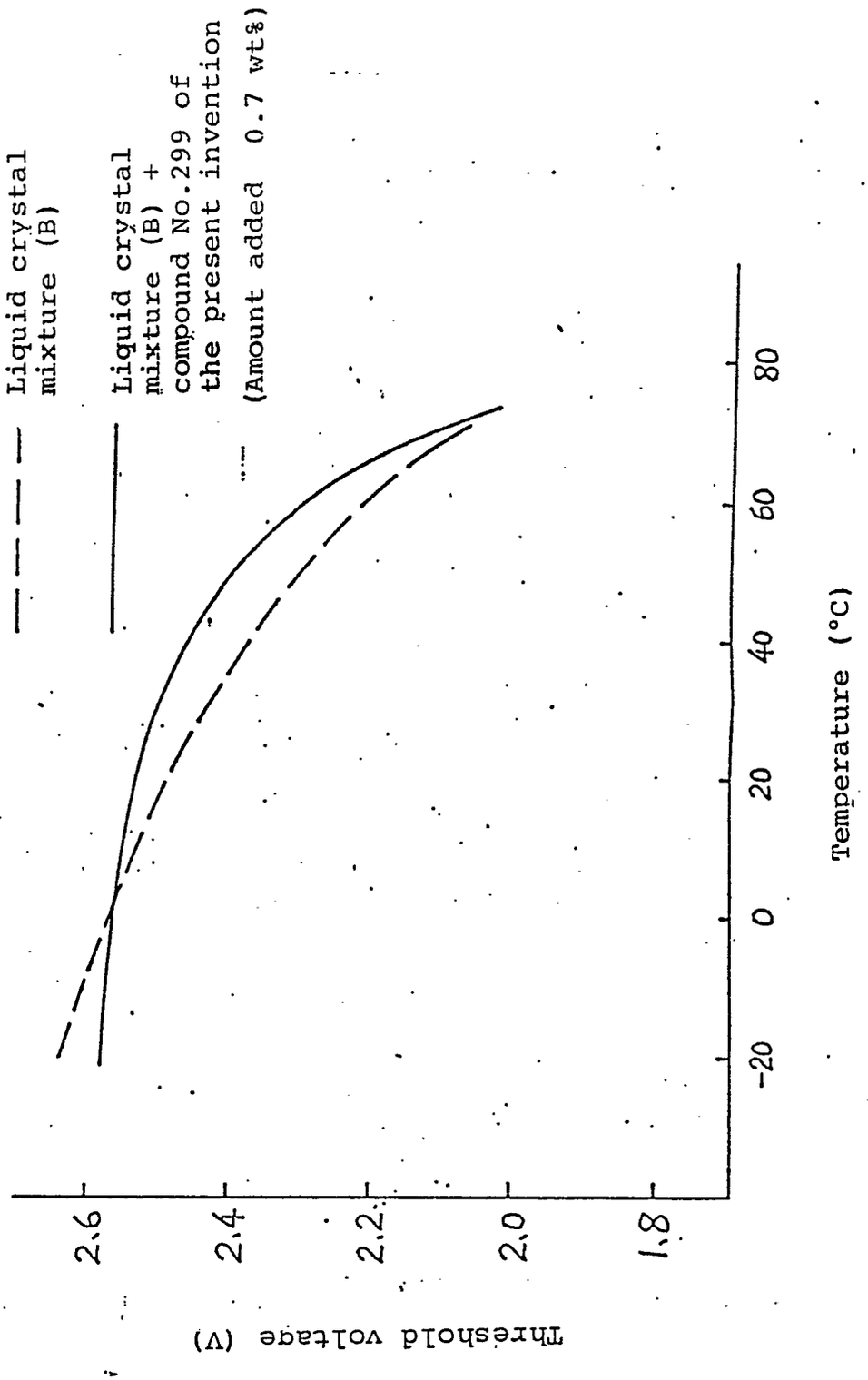

Liquid crystal mixture (B)
Liquid crystal mixture (B) + compound No.299 of the present invention
(Amount added 0.7 wt%)
Threshold voltage (V)
2.6
2.4
2.2
2.0
1.8
-20
0
20
40
60
80
Temperature (°C)

Fig. 2

European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 87108627.8

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	Soviet Inventions Illustrated, Ch section, week D 38, October 28, 1981 DERWENT PUBLICATIONS LTD., London, L 03 * SU-754-815 (VILN UNIV) * --	1	C 07 C 43/215 C 07 C 41/30 //C 09 K 19/18 C 09 K 19/30
A	DE - A1 - 3 040 632 (MERCK PATENT) * Claim 1 * --	1	
A	EP - A1 - 0 174 191 (CHISSO CORPORATION) * Claim 1 * ----	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

C 07 C 43/00
C 07 C 41/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	03-08-1987	REIF

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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